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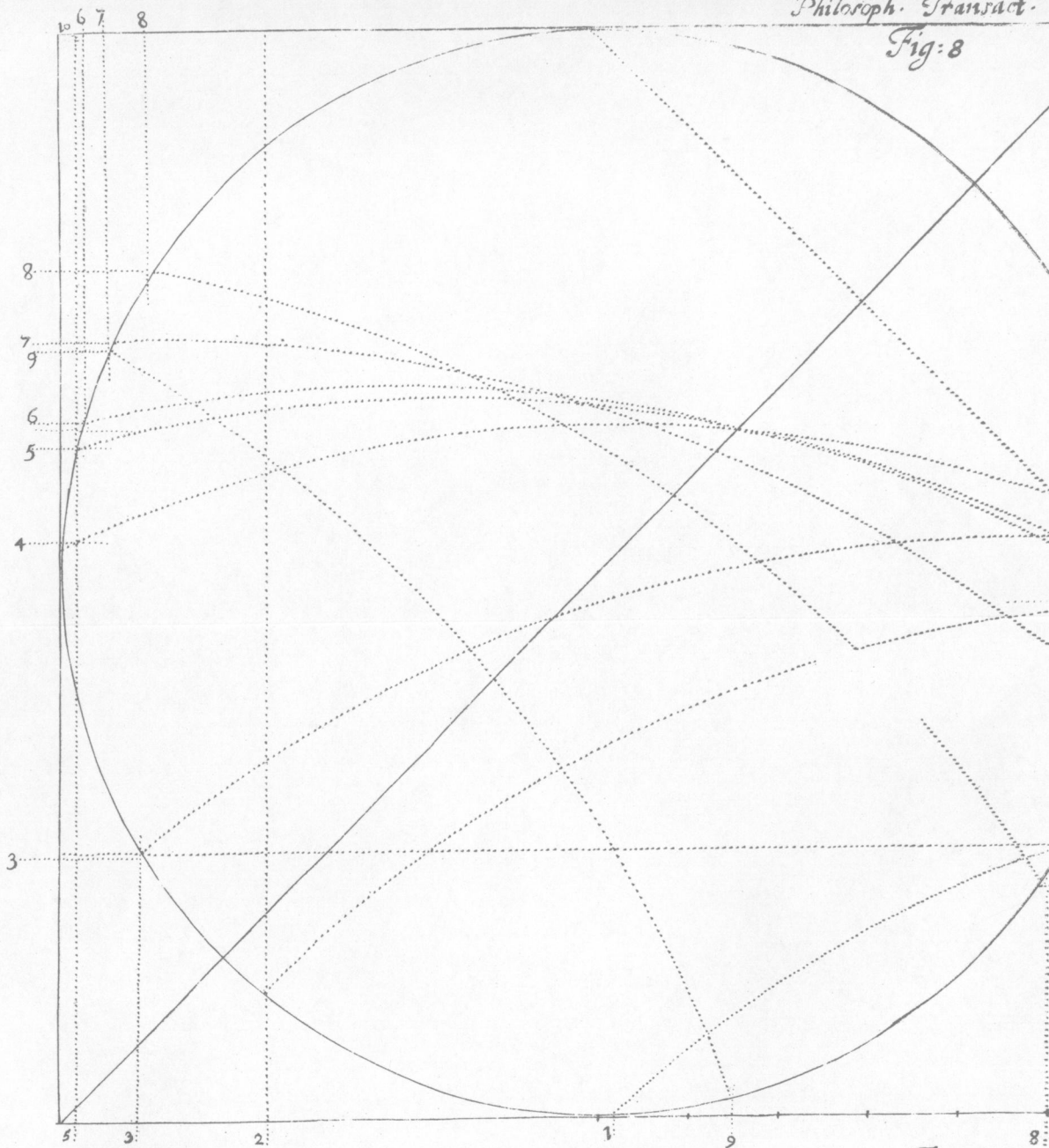


Fig-1

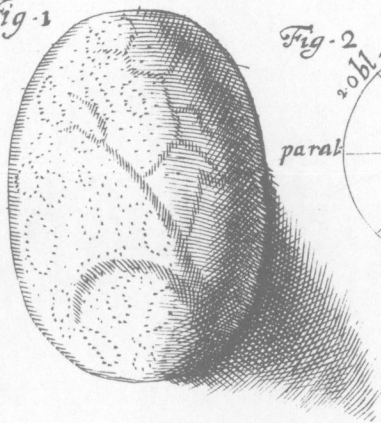


Fig-2

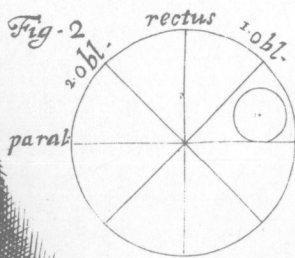


Fig-3

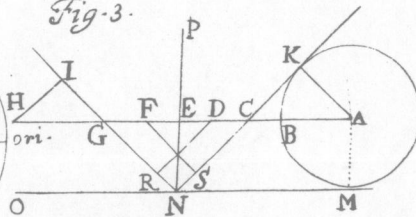


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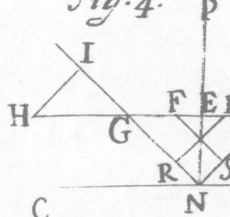


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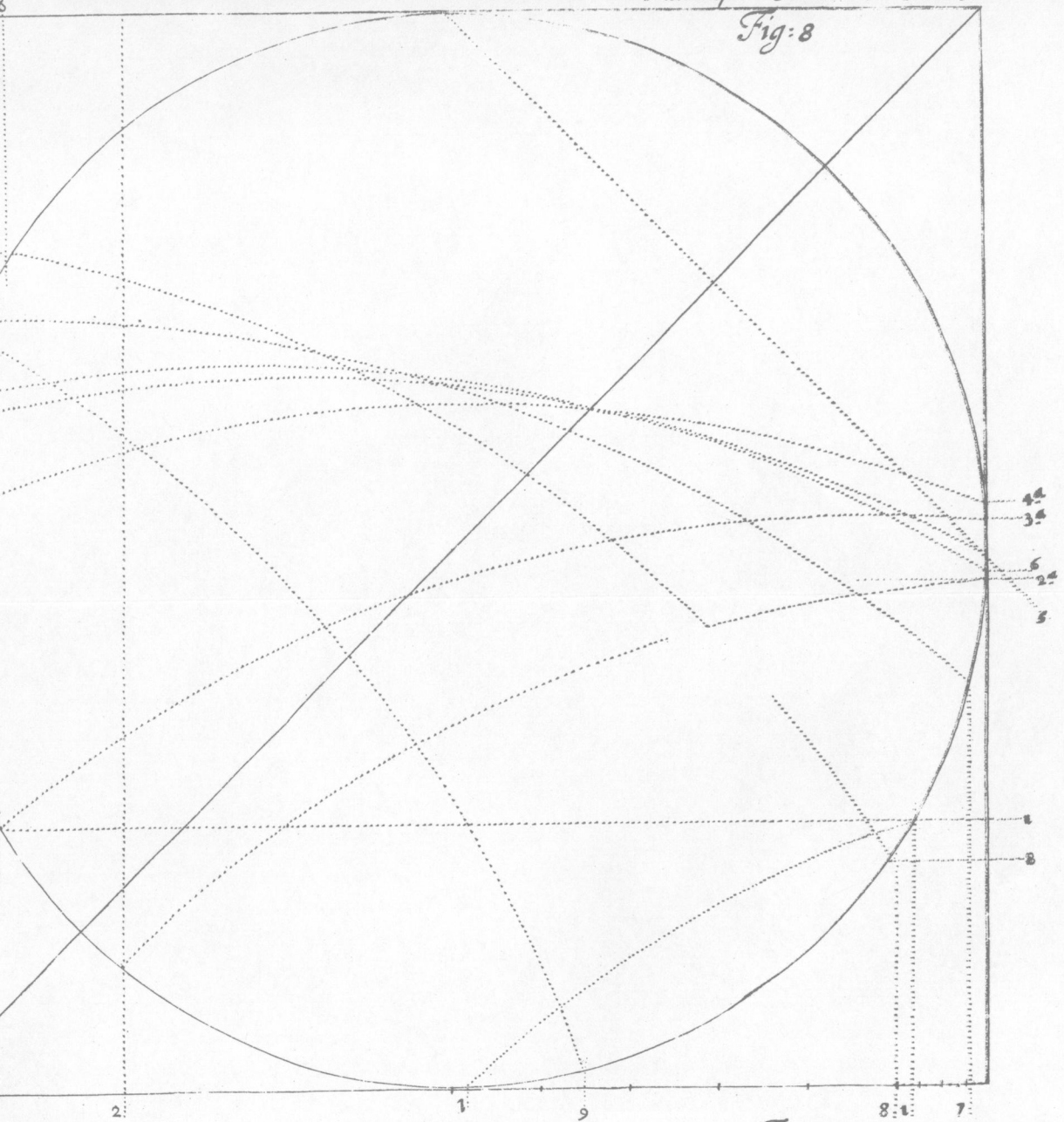


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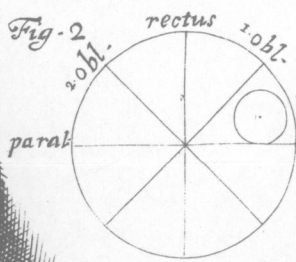


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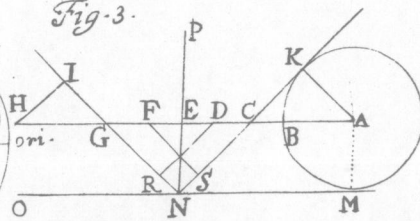
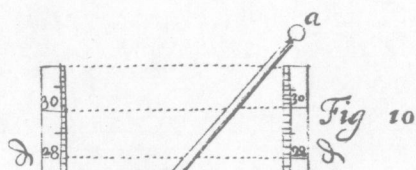
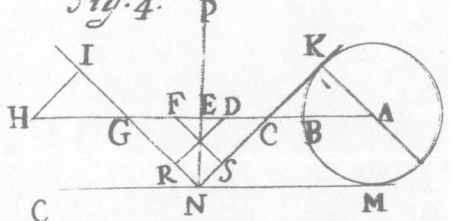


Fig-4.



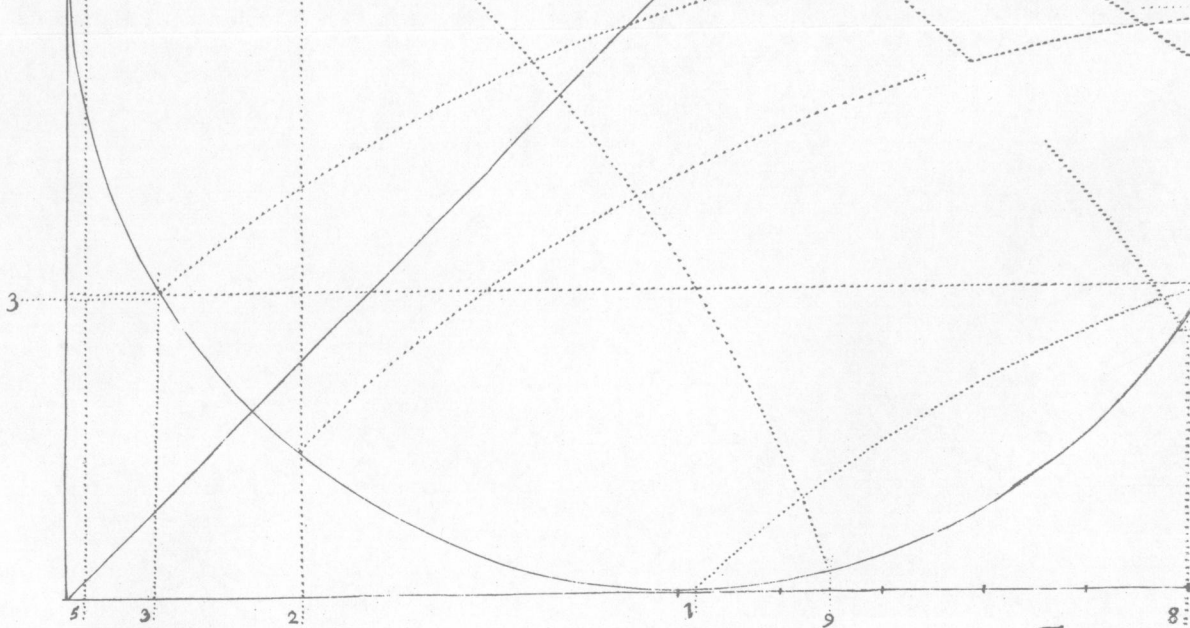


Fig-1

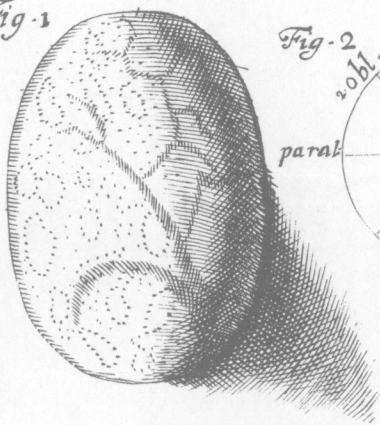


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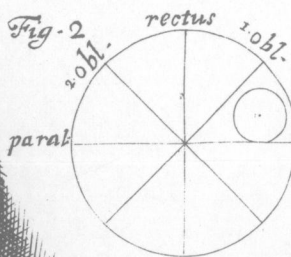


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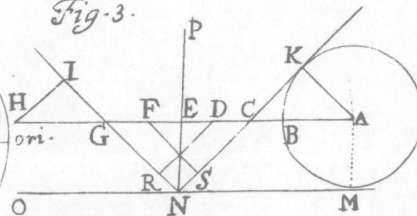


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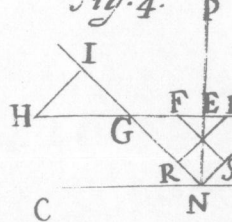


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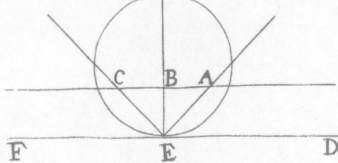


Fig-9

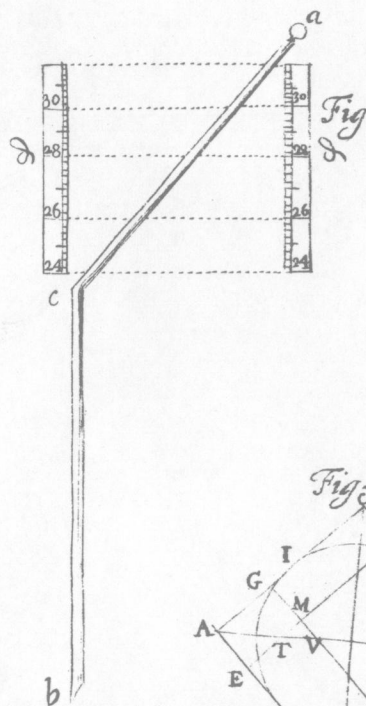
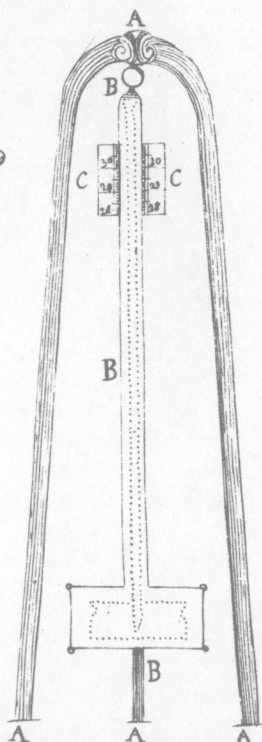


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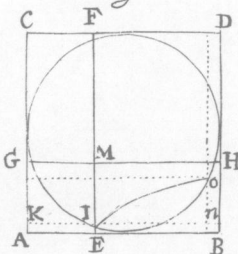


Fig-7



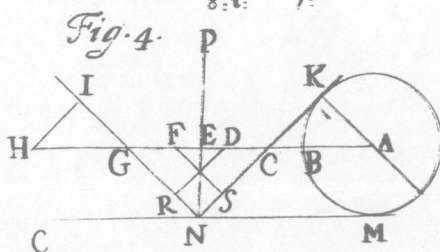
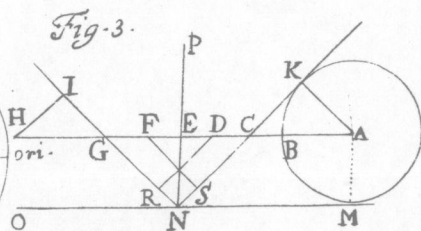
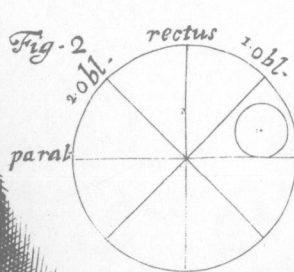
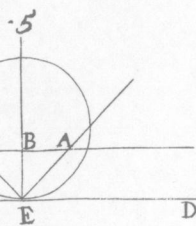
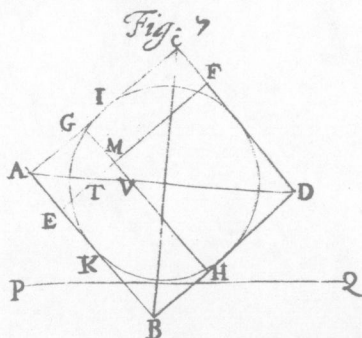
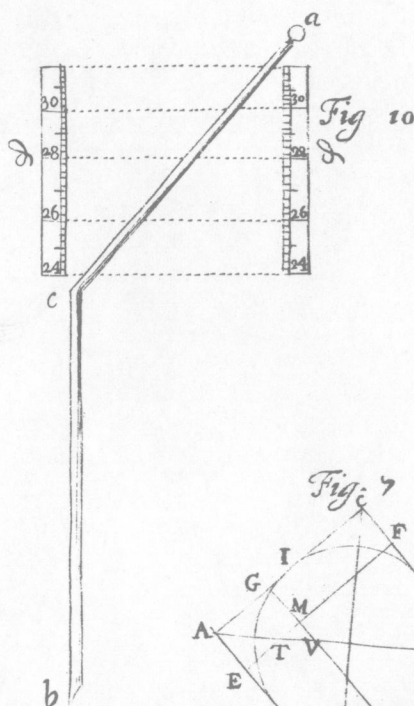
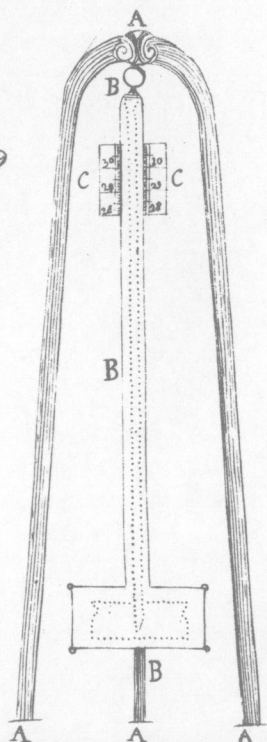


Fig. 9



I. *Part of a Letter of Mr. William Derham, Rector of Upminster, dated Dec. 6. 1697. Giving an Account of some Experiments about the Height of the Mercury in the Barometer, at Top and Bottom of the Monument : and about portable Barometers.*

SOME time since, I had occasion to satisfy my Curiosity, concerning the Variation of the Mercury on different heights ; and accordingly in Sept. 1696. I observed it on the *Monument*, by Two of Mr. *Quare's* best Portable Barometers. By the best of the Two (for both differed) I found the *Mercury* descended $\frac{1}{10}$ of an Inch at the height of 80 Feet, and $\frac{2}{5}$ at 160 Feet.

But since that, finding my Observations a little different from Mr. *Halley's* on *Snowden-Hill*, in *Philos. Transact.* Numb. 229. I thought it necessary to renew my Experiments more nicely ; and accordingly last *November*, tried again with other portable Barometers ; which err'd intollerably. So that by the by, few of the portable Barometers that I have yet met with, are to be depended upon in such Experiments.

I therefore contrived to carry up the Torricellian Experiment to the Top of the *Monument*, thus : I provided a pretty large Glass Tube well cleaned : This I lodged in Wire, and filled with well strained *Mercury* ; which being cleared of all Air, I then plunged the Bottom of the Tube into a broad Cistern of *Mercury*, and then fixed both the Tube and Cistern together, in the Wire Case or Frame. On the Top I left an Eye in the Wire, to suspend the whole Barometer on a String, that it might hang pendulously, which is absolutely necessary ; because if the Cistern be deeper on one side than another, or if the Tube hang more towards one side than the other, it will cause a great and erroneous Variation in the *Mercury* above, according as the Tube stands perpendicularly, or not.

My Instrument being thus (I think) very nicely prepared, I marked exactly the Height of the Quicksilver, upon Two Narrow

Narrow Labels of Paper, pasted on each side the Tube, both at the Bottom, and in my Ascent up the *Monument*. The Differences of the *Mercury's* Height I measured with a Decimal Inch Scale on thin Brass. The Quantity of my Ascent, I measured with a Gunter's Chain, because a String would stretch.

By the nicest Observation I could make, I found that at the height of 82 Feet the *Mercury* fell $\frac{1}{10}$ of an Inch, and at about 164 Feet $\frac{2}{10}$.

By tarrying above somewhat long, I perceived the Pressure of the Atmosphere was somewhat altered, so that the *Mercury* in my Descent, was about $\frac{1}{10}$ of an Inch different from my Observations in ascending. Upon which, I repeated my Experiment by ascending and descending quicker. At both which times, my Observations agreed exactly with the first Tryal. From whence I conclude that at every 82 Feet height, or thereabouts, the *Mercury* will descend $\frac{1}{10}$ Tenth of an Inch.

I was desirous to have observed at this time, the Proportions of the Descent of the *Mercury*, according to Dr. *Wallis's* Remarks in his Letter to you, *Numb. 231*. but found it in vain on so small a height. However, considering there is a Difference of 8 Feet between Mr. *Halley's* Observations and mine (which would alter the *Mercury* $\frac{1}{10}$ of an Inch, which is perceptible) I am inclined to think, that an higher Ascent than 82 Feet is necessary to cause the *Mercury* to descend $\frac{1}{10}$, the higher we are in the Atmosphere. But this I leave to your, and such other better Judgments, and Observations.

Thus, Sir, I have troubled you with the Method I took, as well as the Observations themselves, that you may the better judge how far what I have done deserveth Credit, and also, that I may give some Cautions I found necessary to be observed in such Experiments as these.

To what hath been said, I beg your Patience, while I add a Description of a Portable Barometer, which I conceive may be of great use in the former, and many other such Experiments.

Provide a strong Glass Tube. Let the Head of it be pinched at about an Inch from the top, so as to make a narrow Neck, whose Orifice shall be as big almost as a Straw. This (which is Mr. *Quare's* way) will much bridle the blow of the *Mercury* against

against the top, as it danceth up and down, which endangers breaking off the top of the Tube. The bottom of the Tube I would have ground assant near half an Inch, that the bottom of the Tube touching the bottom of the Cistern, the Orifice thereof may lye about the middle of the *Mercury* in the Cistern: which will prevent the Air getting into the Tube, by reason the *Mercury* is always about the Mouth of the Tube. The Cistern must be made wide, either of Glass, or close-grained Wood; round the Brim of which, on the out-side, must be a Notch to tye on the Leather that is to cover it. When the Tube is filled, cleared of Air, and plunged into the Cistern near full of *Mercury*, enclose the *Mercury* with gentle Leather tied very fast round the Tube near the bottom, which being spread over the Cistern, tie it round that also: The Tube and Cistern, thus conjoin'd with Leather, must be lodg'd in a Case, made very fit to receive both, where they must lye very fast. Thro' the Case let three or four Holes be bored, to let the Air in freely to the Leather that covers the Cistern, which lying close against the Holes, will firmly enough keep the *Mercury* from running out at them.

The whole Instrument thus prepared, must be suspended on the Top: For which purpose a Tripod may be best, whose Legs open and shut by Joynts at the Top.

The Weather-plates are to be put upon the Frame, by setting them to the same height, at which the *Mercury* stands in a common Barometer.

That the whole may be better apprehended, I have annexed the following Figure 9. In which

A. A. A. A. Is the Tripod.

B. B. B. The Frame or Case, with the Barometer and Cistern in it, represented by prickt Lines.

C. C. The Weather-plates.

Fig. 10. Representeth a Tube communicated to me by a Friend, which serveth for the more nice measuring the height of the *Mercury*: For an Inch of perpendicular height, may be made 2 or 3, by bending the Tube more or less. This Tube may be crooked at 28 Inches length, for common use; but at 23 or 24 Inches for greater heights, as *Snowdon* (or higher Hills) on which it descended to 26,1 Inches in Mr. *Halley's* Observations.

a The head of the Tube, with its narrow Neck, to bridle the Blow of the *Mercury*, as before directed.

b The bottom ground assant, as was before directed.

c The Crook.

dd The Weather Plates.